

NNH and Excess events for risk period

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The first formula's for the attributable rate AR and the number needed to harm NNH are from book "Self-Controlled Case Series Studies A Modelling Guide with R" Paddy Farrington, Heather Whitaker, Yonas Ghebremichael Woldeselassie

or

from article "Drug safety studies and measures of effect using the self-controlled case series design" Kumanan Wilson and Steven Hawken:

$$AR = \frac{\rho - 1}{\rho} \frac{n_1}{E} = \left(1 - \frac{1}{\rho}\right) \frac{n_1}{E}$$

$$NNH = \frac{1}{AR} = \frac{1}{1 - \frac{1}{\rho} n_1} \frac{E}{n_1} \approx \frac{1}{1 - \hat{\rho}^{-1}} \frac{E}{n_1} = \frac{1}{1 - RR_{Poisson \ regression}^{-1}} \frac{E}{n_1}$$

incidence rate in control period IR_0 and in risk period IR_1 :

$$IR_0 = \frac{n_0}{61 E} = \frac{IR_{0; per PY per 10^5}}{365.25 * 10^5}; \quad IR_1 = \frac{n_1}{28 E} = \frac{IR_{1; per PY per 10^5}}{365.25 * 10^5}$$

$$\Rightarrow E = \frac{n_0}{61 IR_0} = \frac{n_1}{28 IR_1}$$

$$\Rightarrow \frac{E}{n_1} = \frac{1}{n_1} \frac{n_0}{61 IR_0} = \frac{\frac{n_0}{61}}{\frac{n_1}{28} 28 IR_0} = \frac{1}{28 RR IR_0}$$

$$\Rightarrow NNH = \frac{1}{1 - \frac{1}{RR}} \frac{E}{n_1} = \frac{1}{1 - \frac{1}{RR}} \frac{1}{28 RR IR_0} = \frac{1}{RR - 1} \frac{1}{28 IR_0} = \frac{1}{28} \frac{1}{RR - 1} \frac{365.25 * 10^5}{IR_{0; per PY per 10^5}}$$

$$AR = 28(RR - 1) IR_0 = 28(RR - 1) \frac{IR_{0; per PY per 10^5}}{365.25 * 10^5}$$

excess events for risk period [1;28days] per million vaccinated:

$$n_{excess \ events \ per \ 10^6} = AR * 10^6$$